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Griffiths, Gwyn; Norris, Gareth

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# Explaining the crime drop: contributions to declining crime rates from youth cohorts since 2005

Gwyn Griffiths<sup>1</sup> · Gareth Norris<sup>2</sup> 

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## Abstract

Since the mid-90s there has been almost a 50% reduction in the volume of crime in England and Wales - a trend that has been mirrored in many Western countries (Greenberg *Justice Quarterly*, 31(1), 154–188, 2014). Despite previous assumptions, for example, declining birth cohorts, it is proposed here that the decline in crime for the 1995–2005 period can largely be attributed to a doubling of the probability of a crime being ‘proven’ (cf Lloyd et al. 1994; MOJ, 2012; Taylor 2016). However, in the last decade these reductions in crime rates have levelled off to a relatively stable degree. Analysis of published data relating to the performance of the criminal justice system in England and Wales suggests that reductions in crime levels *since* 2005 are largely accounted for by the fall in proportion of the youth population engaging in offending behaviour. It is argued that falls in rates of crime are largely independent of the offending frequency of young people or variations in the probability of offences being proven; rather, reductions in youth crime over this period could largely be attributed to policy changes, including multiagency interventions targeted at young people who were at risk of starting to offend (McAra and McVie 2015; Smith 2015). Further discussion suggests that the binary proven reoffending rate is not an accurate barometer of criminal justice system performance; rather it is argued that reductions in the youth offending population feed forward into later reductions in the number of adult offenders and further impact on overall crime rates in the longer term.

## Introduction

In the last two decades, the youth justice system in England and Wales has undergone a range of different policy changes designed to reflect the neo-liberal approach to juvenile justice [1]. Dunkel [2] defines this shift as a move away from the “4 Ds” of

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✉ Gareth Norris  
ggn@aber.ac.uk

<sup>1</sup> Ceredigion Youth Justice and Prevention Service, Aberystwyth, UK

<sup>2</sup> Department of Psychology, Aberystwyth University, P5 Penglais, Aberystwyth SY23 3UX, UK

diversion, decriminalisation, deinstitutionalisation and due process, to the “4 Ds” of responsibility, restitution/reparation, restorative [justice] and retribution. Different and often competing models, loosely defined by the opposing models of ‘justice’ and ‘welfare’ [3], policies, which Case and Haines [4] define in more detail as ‘dystopian’ (emphasising control and responsibility) or ‘utopian’ (recognising the rights of children). Whilst these positivistic and classicist models of youth justice are theoretically opposing, a ‘continua’ [4] or ‘hybrid’ range of responses exist in order to address youth offending behaviour, for example, restorative justice and minimum intervention/diversion. Current ‘neo-correctionalist’ models that characterise the dominant approach advocated in England and Wales, are examples of the hybridisation of youth justice policies with an emphasis upon the responsibility of the offender on the one hand and the prevention of further offending on the other [5]. Strategies such as ‘early intervention’ and addressing ‘pre-delinquent’ behaviours have been criticised on the grounds that they punitively address minor negative behaviour at the expense of actual positive ones [4]. However, as Goldson and Muncie note in relation to the continuing shifts in youth justice policy and aims:

“[ ... ] youth justice policy discourses and the systems that emanate from them, comprise fluid sites of contestation and uneasy settlements of competing and/or intersecting thematics including: welfare; justice; informalism; rights; responsibilities; restoration; prevention; remoralization and retribution/punishment” ([6]; p.91)

Hence, these continually shifting aims, policies and practices implemented to address youth crime are essential to be understood in terms of how they contribute to the overall crime rates.

The volume of crime in England and Wales has continued to decline since 1995 and a significant part of the explanation is due to the reduction in the overall proportion of the youth population that are involved in criminal activity [7]. This trend, however, is not seemingly linked to changes in the probability of crimes being *proven* or the actual offending *rate* of young people specifically [8–10]. There are a number of possible reasons that may account for these trends in the data [11]. Firstly, the reduction in the proportion of young people who are offenders implies that fewer young people are acquiring/developing criminal and anti-social behaviour patterns [12]. This trend has been linked to the creation of specialist statutory multi-agency services (Youth Offending Teams or YOTs; see [13]), established in 1998 with a specific remit to ‘reduce offending by young people’ [14]. Increasingly, these teams have worked at both strategic and operational levels to target young people who are at risk of offending (but who may have not yet have crimes *proven* against them; see [15]). Subsequently, this has resulted in the instillation of targeted preventative work involving the co-ordinated activity of police, schools, local education authorities, health services, probation services, and voluntary sector organisations, aimed at tackling some of the root causes of offending by young people, such as a lack of parental supervision and/or substance misuse [16, 17].

Secondly, significant reductions in crime levels in England and Wales – predominantly seen since 1995 – will undoubtedly have resulted in a reduction in the *exposure* of young people to instances of offending behaviour and, more importantly, the

thoughts and attitudes that support criminal conduct [18]. This hypothesis takes the view that offending is a learnt behaviour [19]; if this theory is valid, we would then expect reduced exposure to criminal behaviour to result in less young people acquiring these pro-criminal attitudes and behaviours from peers and adults [20]. There is significant evidence from longitudinal research that has established that these factors (amongst others) are implicated in the observed reduction in the numbers of young people who commit crimes [21, 22]. Hence, the [lack of] learning ‘opportunity’ has been reduced exponentially as less young people become adult offenders, further reducing the chain of learnt anti-social and/or criminal behaviour and attitudes [23]. Related theories, for example, labelling (e.g. [24–26]), and practices such as diversion from custody (see [27, 28]) all implicate criminal behaviour as a learnt process that requires development and reinforcement (positive and negative) to become ingrained and problematic [29]. Recently implemented policies, such as Children First, Offenders Second (CFOS; see [30]; [31]) have seen these ‘child-friendly’ approaches to youth justice emphasise diversion and principles of minimum intervention.

The criminal justice system in England and Wales is currently subject to a number of significant and potentially far-reaching changes [32, 33]. The Legal Aid, Sentencing and Punishment of Offenders Act (LASPO) 2012 introduced a new system of cautioning for ‘proven’ crimes; under LASPO, elected Police and Crime Commissioners have assumed the role of Police Authorities and are now responsible for crime prevention funding, alongside private and voluntary sector organisations undertaking roles previously assigned to Probation trusts [34]. Austerity policies also have a major impact on funding of all criminal justice agencies [35] and subsequently these changes have the potential to trigger increasing crime levels, particularly amongst the youth population [36, 37]. Deterioration in the quality of offender supervision, moves away from ‘effective practice’ principles, reductions in police numbers, inappropriate repeat cautioning, withdrawal of funding from effective interventions and a general fragmentation of the criminal justice system are potential risks that could give rise to increasing crime levels [30]. Given that crime levels – particularly youth crime – have reduced over the last two decades, it is therefore important that the overall performance of the criminal justice system is carefully monitored in a logical and consistent way and that the results used by those responsible for developing and implementing criminal justice policies.

## Exploring the crime drop

Whatever the exact mechanism(s) involved, official data clearly suggests that the criminal justice system in England and Wales as a whole has been effective in reducing crime levels since the early 1990s [38]. In relation to youth justice reforms and policy, these post-1995 drops are linked to changes to policy following the Criminal Justice and Public Order Act 1994 and the Crime and Disorder Act 1998. The former impacted on the behaviour of young people specifically by restricting rights to silence, stopping illegal music gatherings (“raves”) and increased powers of stop and search (amongst others). The establishment of the Youth Justice Board and defined the principal aim of the youth justice system as ‘to prevent offending by children and young persons’ [39]. Additional measures, such as the Criminal Justice Act 2003 and the creation of Multi-Agency Public Protection Arrangements (MAPPA) have seen the implementation of a

risk monitoring approach to assess offenders both pre and post release. Two key assessment tools were implemented, OASys (adult probation) and ASSET (youth justice board), to address risk of harm to both offenders and the public and, amongst other things, plan housing and monitoring and manage and disclose information where necessary. Despite criticisms – particularly on civil liberties grounds and/or particularly for youth offenders [30] – the general success in terms of managing and reducing offending by formalised risk assessment tools and the subsequent behavioural interventions that they initiated has been one of the most fundamental changes to the criminal justice system in recent years [5].

However, some of this impact has not been explicitly recognised due to the reliance on arguably out-dated and potentially inaccurate metrics such as the binary reoffending rate (BRR; see [40]). The BRR in essence contains two groups: those offenders who continue to commit crime (“recidivists”) and those that don’t (“desisters”). The main limitation of using the BRR as a barometer for criminal justice performance is that it does not take into account reductions in offending frequency and/or the proportion of the population that are actual offenders [10]. Hence, it is possible that some extraneous factor may have been responsible for driving down offending rates over the 1995 to 2005 period; subsequently the increase in the probability of a crime being proven could be a direct result of the reduced offending rate caused by these extraneous factor(s). For example, if fewer offences are committed, criminal justice services (predominantly the police) may be able to focus more effort proportionately on each offence thus increasing the probability of individual offences being proven. Notwithstanding, it should be noted that the actual percentage of the population involved in criminal behaviour remained relatively constant throughout the 1995 to 2005 period. If some other anti-criminogenic factor was indeed growing in influence over the period, we would also have expected this to have an impact on the proportion of the population engaged in criminal activity [41]. Furthermore, to date, attempts to correlate reduced crime rates with socio-economic factors such as employment rates have failed to identify any strong links [42, 43]. Hence, neither the BRR and/or the probability of a crime being proven are able to account for the post-2005 crime reductions, as both indices have remained relatively constant since this period.

The primary aim of the current analysis is to examine the role of youth offending in explaining the crime drop experienced in England and Wales since the mid-90s in two key stages. Firstly, the reduction in overall crime from 1995 to 2005 will be examined in respects to the probability of a crime being proven, where it is argued that the major falls in the adult offending rates were experienced. Secondly, the continued reduction in youth crime rates from 2005 onwards will be analysed in relation to both youth justice interventions and the knock on effect of a reduction in adult offending (see Fig. 1). Recent research from The Howard League for Penal Reform has shown that there has been an aggregate 54% fall in child arrests in the period 2010–2014 [44]. Indeed for some UK counties, the reduction was even more substantial; Dyfed-Powys in Wales experienced a 70% fall in arrest figures. Overall, the figures show a reduction in arrests from 245,763 in 2010 down to 112,037 in 2014, whereas the corresponding figures for the adult population are 1,386,000 to 1,041,000, a reduction of 25% [45, 46]. Hence, we can see more than double the percentage reduction in the juvenile arrest data and it is the significance of this for crime reduction policies that we seek to focus upon.

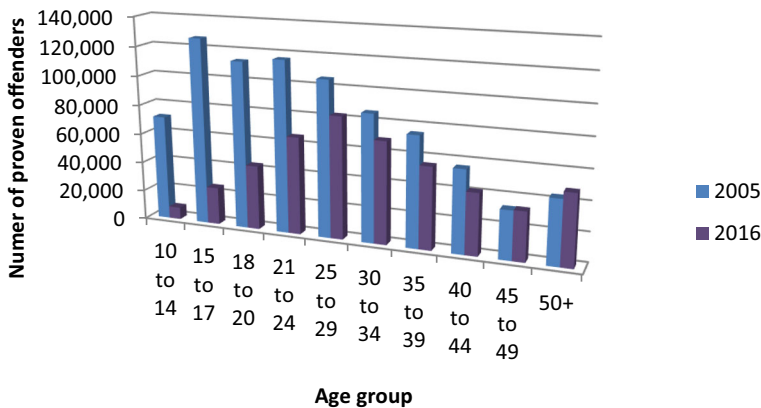


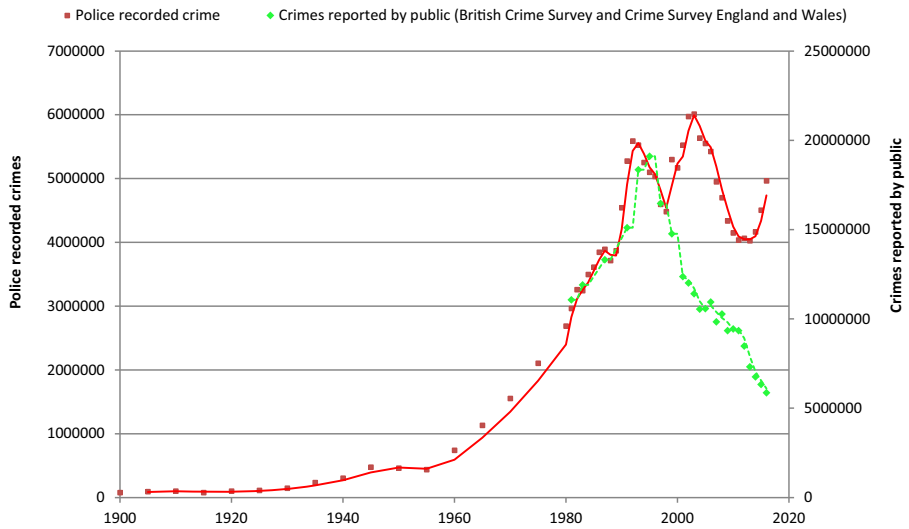
Fig. 1 Numbers of proven offenders by age group for 2005 and 2016

By comparing two independent data sets, the estimated total number of crimes committed annually in England and Wales (adult and juvenile) has shown a decrease of approximately 55% since the mid 90s (see Fig. 2 below<sup>1</sup>), independently of any particular socio-economic trends such as unemployment levels (see Raphael and WinterEbmer [47], for a general review). Over the same period, the proportion of proven offenders that go on to commit further proven crimes within 12 months - also referred to as the *binary proven reoffending rate* (BRR) - has remained more or less constant (see Fig. 3). One additional variable that has also remained relatively static is the proportion of the population that are proven offenders, also referred to as the *offending population* (Fig. 3). These combined observations have led to the assumption that the criminal justice system in itself has not contributed to the observed reductions in crime levels, but rather phenomenon such as changes in reporting practices have been far more influential [8, 48].

Published data on the Criminal Justice system in England and Wales overwhelmingly refers only to *proven crimes* (i.e. crimes supported either by admission or a finding of guilt by a court) and *proven offenders* (i.e. those admitting/proven guilty of a crime). However, it is relatively naïve assumption that the number of proven crimes and proven offenders correspond directly to the actual number of crimes and offenders in the population respectively [49]. For example, Lloyd et al. [8], estimate that only 3% of all offences ever result in a conviction and a recent report indicates that police recording of reported crimes was below 85% in some areas [50]. This caveat applies also to the published figures related to proven reoffending rates, including the binary proven reoffending rate and frequency of reoffending [11, 51]. Figure 3 (below) plots the relative stability of these two variables over the time series analysis. Henceforth, a more detailed understanding of the dynamics of the criminal justice system requires knowledge of *actual numbers of crimes*, *number of offenders* and *actual offending rates* along with estimations of the *probability of crimes being proven* [52].

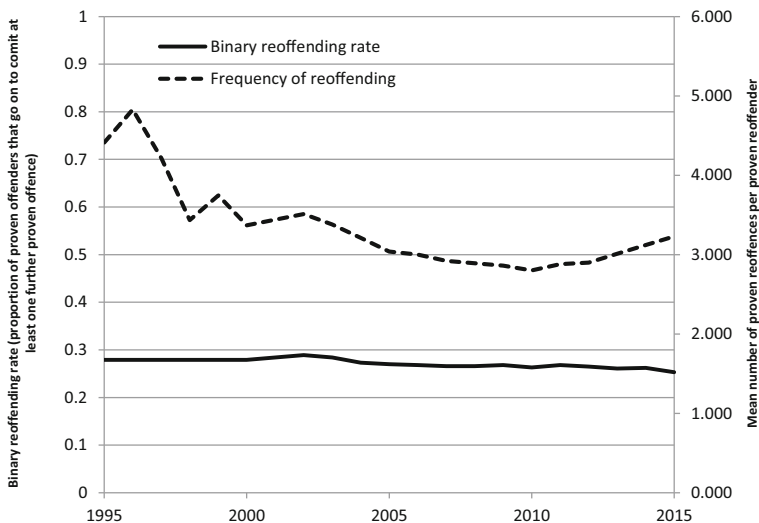
Whereas many previous attempts to explain the crime drop have focused upon aggregate data, the introduction of variance in the key predictor variables allows for a closer inspection of the interaction effects. Explicitly, the aim of this analysis is

<sup>1</sup> NB. the triple peaks in police recorded crime coincide with changes in the way in which police record crime.



**Fig. 2** Recorded crime in England and Wales 1900 to 2015

twofold: (1) To develop and improve understanding of the dynamics of populations resident in the criminal justice system in England and Wales; and, (2) To develop and improve our understanding of the factors that have driven down the volume of crime reported by the public in England and Wales since the mid 90s. In particular, we develop this analysis by separating adult and youth statistics to demonstrate the impact of youth justice policy in maintaining the downward trajectory of the latter group; the most recent reductions in crime rates – we argue – are almost entirely due to a decrease in the youth offending population.



**Fig. 3** Variation in the proven reoffending rates of offenders in England and Wales (based on MOJ data)

## Methodology

### Definitions of key variables used in the analysis and their interrelationships

The population ( $P_t$ ) is the number of individuals (aged 10 years or older) in England and Wales during a specified 12-month period ( $t$ ).<sup>2</sup> In this analysis, specified 12-month periods run from 1st of April in any given year to 31st of March the following year as per official statistics data periods.

The crime level ( $C_t$ ) is the total number of crimes committed in England and Wales during the specified period. The proven crimes level ( $PC_t$ ) during a specified period is the total number of crimes that are reported to the Police, followed up and proven (either by admission or by a finding of guilt in court).

Subsequently, the probability of a crime committed during a specified period being proven during any given year ( $B_t$ ), is simply the ratio of the number of proven crimes ( $PC_t$ ) to the total number of crimes ( $C_t$ ), during the given year:

$$B_t = \frac{PC_t}{C_t}$$

By definition,  $B_t$  cannot be greater than 1 as this value is essentially independent of the characteristics of the individual that commits the crime. In other words, when an offender is detected the probability that other offences committed by the same offender will be detected is assumed to be unaffected, although in some instances – other crimes taken into consideration, for example – we acknowledge that this assumption will not hold true.

An offender is any individual aged 10 years and above<sup>3</sup> that has committed at least one crime during a specified 12-month period ( $t$ ). A proven offender is an individual (aged 10 years or older) whom has - during the course of a specified 12-month period - had one or more of the crimes that they have committed attributed to them during the specified period being proven.

The proven offending population ( $POP_t$ ) is all the individuals classed as proven offenders during a specified 12-month period (April to March). Existing within the offending population ( $OP_t$ ) is all the individuals who are classed as offenders during the specified 12-month period. Subsequently, within the offending population, a proportion ( $N_t$ ) of the individuals will be proven offenders:

$$N_t = \frac{POP_t}{OP_t}$$

<sup>2</sup> For ease of reference key variables used in the analysis have been listed in Appendix Table 4.

<sup>3</sup> 10 years of age is the age of criminal responsibility in England and Wales.



The offending frequency ( $OR_t$ ) is the mean number of crimes committed per offender per year. By definition  $OR_t$  cannot be less than 1. The mean offending frequency of the offending population is given by:

$$OR_t = \frac{C_t}{OP_t}$$

The proven offending frequency ( $POR_t$ ) is the mean number of proven crimes committed per proven offender per year. Again, by definition,  $POR_t$  cannot be less than 1. The proven offending frequency of the population of proven offenders is given by:

$$POR_t = \frac{PC_t}{POP_t}$$

Offenders in an offending population are distributed among  $n$  different offending frequency classes. Each offending frequency class contains  $OP_{t,x}$  offenders who offend at a rate  $OR_{t,x}$ :

$$OP_t = \sum_{x=n}^{x=1} OP_{t,x}$$

During any given interval a proportion ( $BOR_t$ ) of the individuals in the population will commit crimes:

$$BOR_t = \frac{OP_t}{P_t}$$

Variable BOR is, therefore, the *proportion* of population whom are offenders, defined by the offending population (estimated) divided by the total population.

### Estimating population data

It is possible to substitute these variables in each equation with estimated values from published data. The actual population ( $P_t$ ) can be calculated directly from mid-year population tables for England and Wales published by the Office for National Statistics (see Table 1); there are approximately 65 million individuals living in England and Wales.

The number of crimes ( $C_t$ ) can also be estimated from published data. The Crime Survey for England and Wales (CSEW; formerly the British Crime Survey) provides an estimate of the number of crimes committed in England and Wales during any given year ( $v_t$ ; See Table 2). This estimate is derived by asking a sample of the population if they had been the victims of any crimes during the given year. Certain crimes are by their nature excluded from the estimate (see Table 3), as they do not result in an identifiable individual victim. Police recorded crime includes all types of crimes and can therefore be used to provide an estimate of the proportion ( $g_t$ ) of all crimes that are excluded from the CSEW. This proportion can be used to correct the estimate ( $v_t$ ) and account for the crimes that

**Table 1** Published statistics for the criminal justice system and population size for England and Wales 1988 to 2015

Year	Number of crimes		Proportion of police recorded crimes cleared up	Population size			Number of proven offenders			Proportion of proven offenders committing proven reoffences		Number of proven reoffences committed per proven reoffender		
	Crime survey	Police recorded		10 yrs.+	10-17 yrs	18 yrs.+	10 yrs.+	1 0 - 17 yrs	18 yrs.+	10 yrs.+	1 0 - 17 yrs	10 yrs.+	1 0 - 17 yrs	18 yrs.+
1988	13,762,500	3,716,000	0.349	43,823,300	5,108,500	38,714,800								
1989	14,212,000	3,871,000	0.328	43,908,800	4,977,800	38,931,000								
1990	14,661,500	4,544,000	0.308	44,015,100	4,912,900	39,102,200								
1991	15,111,000	5,276,137	0.287	44,131,600	4,885,400	39,246,200								
1992	16,733,000	5,592,000	0.256	44,198,000	4,876,800	39,321,200								
1993	18,355,000	5,526,000	0.246	44,273,600	4,895,100	39,378,500								
1994	18,732,000	5,253,000	0.256	44,366,300	4,941,700	39,424,600								
1995	19,109,000	5,100,241	0.267	44,530,000	5,041,900	39,488,100	593230							
1996	17,789,000	5,037,000	0.267	44,687,300	5,133,300	39,554,000	557841							
1997	16,469,000	4,598,327	0.287	44,856,300	5,183,900	39,672,400	589079							
1998	15,615,500	4,481,817	0.287	45,071,500	5,229,000	39,842,500	636023							
1999	14,762,000	5,301,000	0.256	45,331,600	5,275,600	40,056,000	643454							
2000	13,647,000	5,171,000		45,624,500	5,326,300	40,298,200	617,024	139,326	477,698	0.279	0.337	0.262	3.370	3.390
2001	12,532,000	5,525,024		45,963,000	5,411,200	40,551,800	624,545	137,864	486,681	0.284	0.336	0.269	3.440	3.490
2002	12,260,000	5,974,960		46,278,500	5,460,100	40,818,400	632,065	136,401	495,664	0.289	0.334	0.276	3.510	3.590
2003	11,642,000	6,013,759		46,573,500	5,478,000	41,095,500	659,039	138,379	520,660	0.284	0.343	0.269	3.380	3.440
2004	10,679,000	5,637,511		46,877,500	5,484,600	41,392,900	662,052	149,452	512,600	0.273	0.336	0.255	3.210	3.270
2005	10,715,000	5,555,172		47,300,800	5,484,100	41,816,700	695,590	163,545	532,045	0.270	0.336	0.249	3.040	3.100
2006	11,060,000	5,427,558		47,666,400	5,468,700	42,197,700	714,532	168,471	548,061	0.268	0.336	0.247	3.000	3.050

Table 1 (continued)

Year	Number of crimes	Proportion of police recorded crimes cleared up	Population size			Number of proven offenders			Proportion of proven offenders committing proven reoffences			Number of proven reoffences committed per proven reoffender		
			10 yrs.+	10-17 yrs	18 yrs.+	10 yrs.+	1 0 - 17 yrs	18 yrs.+	10 yrs.+	1 0 - 17 yrs	18 yrs.+	10 yrs.+	1 0 - 17 yrs	18 yrs.+
2007	10,022,000	4,952,276	48,067,900	5,474,300	42,593,600	749,338	173,588	575,750	0.266	0.336	0.245	2.920	2.850	2.940
2008	10,446,000	4,702,698	48,452,600	5,453,200	42,999,400	760,676	165,179	595,497	0.266	0.324	0.249	2.890	2.760	2.940
2009	9,503,000	4,338,372	48,776,200	5,408,900	43,367,300	725,628	139,732	585,896	0.268	0.328	0.254	2.860	2.760	2.890
2010	9,623,000	4,150,097	49,139,800	5,359,900	43,779,900	681,555	113,584	567,971	0.263	0.333	0.249	2.800	2.790	2.800
2011	9,500,000	4,023,000	49,509,700	5,312,000	44,197,700	641,742	88,357	553,385	0.268	0.358	0.254	2.880	2.870	2.880
2012	8,873,000	3,838,000	49,743,500	5,229,900	44,191,100	601,924	70,504	531,420	0.265	0.355	0.253	2.900	2.880	2.900
2013	7,318,000	4,028,000	49,994,815	5,183,248	44,811,567	537,611	52,648	484,963	0.261	0.361	0.250	3.010	2.990	3.010
2014	6,764,000	4,167,000	50,351,333	5,163,989	45,187,344	510,433	42,299	468,134	0.262	0.380	0.252	3.120	3.120	3.120
2015	6,334,000	4,507,000	50,737,545	5,157,876	45,579,669	477,393	36,260	441,133	0.253	0.379	0.243	3.230	3.300	3.220

**Table 2** Comparison of the number of disposals (court and out of court) and proven offences for period 2009 to 2013 \* Derived from Crime in E&W year ending September 2013\*

	Year to March				
	2009	2010	2011	2012	2013
Number of out of court disposals	557,581	476,794	419,702	391,171	334,847
Number of court convictions	754,516	750,449	764,889	733,420	672,730
Total number of disposals	1,312,097	1,227,243	1,184,591	1,124,591	1,007,577
Number of proven offences <sup>1</sup>	1,413,744	1,306,363	1,258,825	1,190,551	1,064,108
Number of proven offences per disposal	1.08	1.06	1.06	1.06	1.06

<sup>1</sup> includes out of court disposals, convictions and offences taken into consideration

are not picked up by the survey. The mean value of  $g$  over the 2002 to 2013 period was 1.44 (range over the period 1.41 to 1.48).

$$g_t = \frac{e_t}{r_t}$$

Where  $r_t$  is the total number of crimes recorded by the police and  $e_t$  is the number of crimes recorded by the police that are not reported on in the crime survey. Therefore, the number of crimes ( $C_t$ ) is estimated by:

$$C_t = v_t + (v_t * g_t)$$

### Estimating the number of Proven Crimes (PC<sub>t</sub>)

Data published by the Ministry of Justice covering the period 2000 to 2012 ([9]; Table 3), provides an estimate of the proportion of the proven offenders during any given year whom will go on to reoffend within 12 months of their index disposal/event ( $o_t$ ). The same data also includes estimates of the mean number of proven re-offences per proven offender committed in the 12-month period after the index disposal/event ( $y_t$ ). This allows us to estimate the mean number of proven re-offences committed per proven offender per 12-month period.<sup>4</sup> The total number of proven re-offences committed by all proven offenders during any given year ( $m_t$ ) can therefore be estimated as follows:

$$m_t = POP_t * o_t * y_t$$

<sup>4</sup> Some of the index disposal linked crimes will have been committed in the year preceding the given year but these will be largely 'balanced' by index disposal linked crimes committed by proven offenders in the year subsequent to the given year.

**Table 3** Police recorded offences that are not picked up in the British Crime Survey \*Derived from Crime in E&W year ending September 2013\*

Offence category	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Homicide	1047	904	868	764	758	775	664	620	639	553	553	542
Causing death by aggravated vehicle taking	56	63	40	24	18	18	14	5	14	7	8	10
Causing death by driving unlicensed or disqualified or uninsured drivers	0	0	0	0	0	1	8	16	6	6	10	4
Cruelty and neglect of children	4109	6083	5724	5045	4917	5287	6204	6611	6087	6081	3019	–
Abandoning a child under 2 yrs.	59	49	49	49	23	19	23	9	6	12	3	–
Child abduction	846	930	1035	919	696	595	567	560	548	532	514	546
Sexual offences	56,652	60,412	60,924	60,287	56,042	52,166	50,185	53,006	53,940	52,760	53,538	59,466
Robbery of business property	11,066	10,110	7934	8760	9454	9173	9360	8182	7729	6880	6120	3019
Non-domestic burglary	452,516	417,668	358,851	344,551	329,752	303,014	297,153	272,039	264,518	255,736	232,519	231,137
Shoplifting	310,881	303,235	281,127	295,999	294,828	290,653	320,739	307,823	305,896	308,326	300,623	313,639
Theft by employee	17,530	17,700	17,251	17,048	16,323	15,864	15,467	13,169	12,141	11,589	10,455	10,352
Dishonest use of electricity	1413	1309	1293	1299	1497	2024	1785	1736	1860	1948	2007	2062
Theft from an automatic machine or meter	24,311	29,515	35,918	42,049	33,721	11,932	7651	7753	6215	6692	6395	5613
Making off without payment	129,125	132,625	102,910	87,774	82,266	73,897	80,053	70,399	66,511	61,358	50,840	49,653
Criminal damage to a building other than a dwelling	176,702	186,784	174,489	161,436	160,207	131,146	109,440	88,687	75,677	67,329	57,632	54,910
Racially or religiously aggravated criminal damage to a building other than a dwelling	1160	1185	1137	1274	1079	833	778	663	534	431	215-	
Drug trafficking	22,435	24,628	24,190	25,276	26,550	28,323	29,885	33,223	32,336	31,316	29,761	28,946
Possession of drugs	120,883	118,883	121,647	153,203	167,683	201,590	213,651	202,361	200,586	197,783	178,250	171,694
Possession of weapons offences	36,379	39,021	40,625	39,711	38,937	37,079	35,662	28,758	26,327	23,688	19,913	20,114

**Table 3** (continued)

Offence category	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Public order offences	129,917	158,178	191,872	222,581	236,661	218,380	204,289	188,254	173,081	150,858	132,202	130,866
Miscellaneous crimes against society	78,605	79,885	75,511	74,682	64,328	57,254	55,666	52,053	48,000	44,981	42,483	42,785
Fraud offences	183,681	170,209	160,736	129,474	105,176	71,135	72,309	73,257	72,435	72,761	62,232	22,040
Total recorded offences excluded from crime survey	1,758,975	1,759,376	1,664,131	1,672,205	1,630,916	1,511,158	1,511,553	1,409,184	1,355,086	1,301,627	1,189,282	1,150,398
Total recorded offences	5,974,960	6,013,759	5,637,511	5,555,172	5,427,558	4,952,277	4,702,697	4,338,295	4,150,916	4,023,155	3,731,669	3,725,281
Conversion factor for Crime survey offences to all offences	1.42	1.41	1.42	1.43	1.43	1.44	1.47	1.48	1.48	1.48	1.47	1.45

During any given year the index disposal of each proven offender is linked to one or more proven crimes. The total number of proven crimes linked to index disposals/events ( $f_t$ ) is given by:

$$f_t = POP_t * j_t$$

Where  $j_t$  is the mean number of proven crimes per index disposal/event. It is possible to estimate  $j_t$  directly from published data (Table 2, [9]). Over the 2009 to 2013 period,  $j_t$  remained more or less constant from year to year (range 1.06 to 1.08) with a mean value of 1.064.

The total number of proven crimes in any given year is then given by:

$$PC_t = m_t + f_t$$

For the period 1988 to 1999  $PC_t$  can not be estimated in this way. For this period  $PC_t$  has been estimated by using published data on detection rates ( $d_t$ , the proportion of Police recorded crimes cleared up; (Crime in England and Wales 2009/10; Table 2).

$$PC_t = r_t * d_t$$

This method of estimating  $PC_t$  may lead to an over-estimate, as not all crimes that are cleared up are ‘proven’, for example, those found not guilty or where no further action (NFA) is taken.

### Estimating the number of Proven Offenders (POP<sub>t</sub>)

The MOJ define proven offenders as: “[...] the number of offenders that in any one year receive a caution (for adults), final warning or police reprimand (for young people), a non-custodial conviction (including fines and discharges) or who are discharged from custody or secure accommodation (young people only)” ([10], p.3). The disposal or event that resulted in an individual being classed as a proven offender during a given year is referred to as the Index disposal or event [53].

Data is available on the number of individuals that were supervised by probation and prison services annually for the years 1995 to 2005 [54]. For the years 2000 to 2005 there is a direct linear relationship between the number of individuals supervised and  $POP_t$  ( $r^2 = 0.8487$ ,  $Pr < 0.01$ ). This relationship has been used to estimate  $POP_t$  for the years 1995 to 1999.

$$POP_t = (3.8012 * s_t) - 305838$$

### Estimating Offending Population (OP<sub>t</sub>)

Combinatorics can be used to analyse the likelihood of two or more proven crimes being linked to the same proven offender. The following analysis assumes that the probability of a crime being proven is independent of which offender commits the crime.

Each of the  $C_t$  crimes committed by the  $OP_t$  offenders during the time interval  $t$  can be considered to be distinct elements of a collection of size  $C_t$  (e.g. crime 1, crime 2, ..., crime  $C_t$ ). The proven crimes ( $PC_t$ ) during an interval  $t$  can then be considered to be a sample of this collection, with the size of sample being  $PC_t$ . Such a sample might contain for example 3 proven crimes (e.g. crime 4, crime 10, crime 42).

The total number of possible combinations ( $Com$ ) of distinct proven crimes in a sample of size  $PC_t$  is:

$$Com = \frac{C_t!}{(C_t - PC_t)! PC_t!}$$

The number of these combinations that include  $w$  distinct or particular elements (e.g. 3 particular crimes linked to a particular offender) is given by:

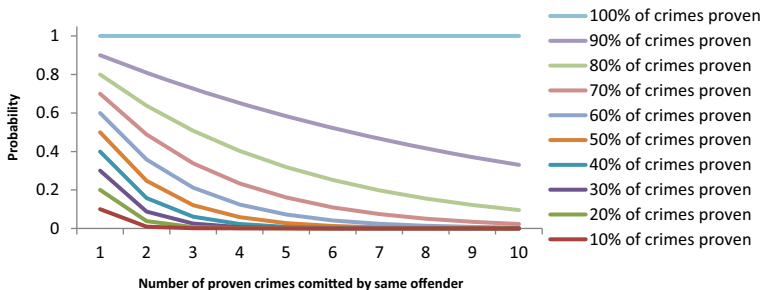
$$Com_w = \frac{(C_t - w)!}{[(C_t - w) - (PC_t - w)]! (PC_t - w)!}$$

The probability ( $Pr_w$ ) that a sample will contain  $w$  distinct or particular elements (e.g. 3 crimes linked to a particular individual offender) is given by:

$$Pr_w = \frac{Com_w}{Com}$$

$Pr_w$  is dependent on the size of the sample relative to the size of the collection i.e. the proportion of the collection sampled or the proportion of crimes that are proven (see Fig. 4).  $Pr_w$  is independent of collection size ( $C_t$ ). Note that the proportion of crimes that are proven is equal to  $B_t$ .

This analysis demonstrates that even if the original collection of  $C_t$  crimes contains sets of multiple crimes committed by particular offenders, providing  $B_t$  is less than 0.1, it is very unlikely that the sample of proven crimes ( $PC_t$ ) will contain more than 1 crime linked to any particular offender. Under these circumstances  $POP_t$  will increase in direct proportion to sample size (equivalent to  $B_t$ ) up the point at which the sample size (or  $B_t$ ) is sufficient to contain all the offenders in the population. At this point  $POP_t$  will equal  $OP_t$  and the number of proven offences per offender ( $POR_t$ ) will be 1. After this point increasing sample size will have no effect on  $POP_t$  but  $POR_t$  will continue to increase



**Fig. 4** Effect of sample size (or the proportion of crimes that are proven) on the probability of the sample containing 1 or more, 2 or more, 3 or more ..... 10 or more proven crimes committed by the same offender



above 1. The point at which the sample size or  $B_t$  is sufficient to contain all the offenders in the population depends on the mean offending rate ( $OR_t$ ) of the offending population. If  $OR_t$  is 100 offences per offender when  $B_t$  is 0.01 it is highly probable that at least one of the offences committed by each offender will have been proven. Likewise if  $OR_t$  is 20 offences per offender when  $B_t$  is 0.02 it is highly probable that at least one of the offences committed by each offender will have been proven (see Fig. 5).

From the above, it can be established that if  $B_t$  is less than 0.1 and  $POR_t$  is greater than 1,  $POP_t$  will be a reasonable estimate of  $OP_t$ . Estimates of  $B_t$  and  $POR_t$  derived from published data indicate that for the offending population in England and Wales over the period in this study,  $B_t$  was less than 0.1 (min 0.050, max 0.096) and  $POR_t$  was always greater than 1 (min 1.800, max 2.411).

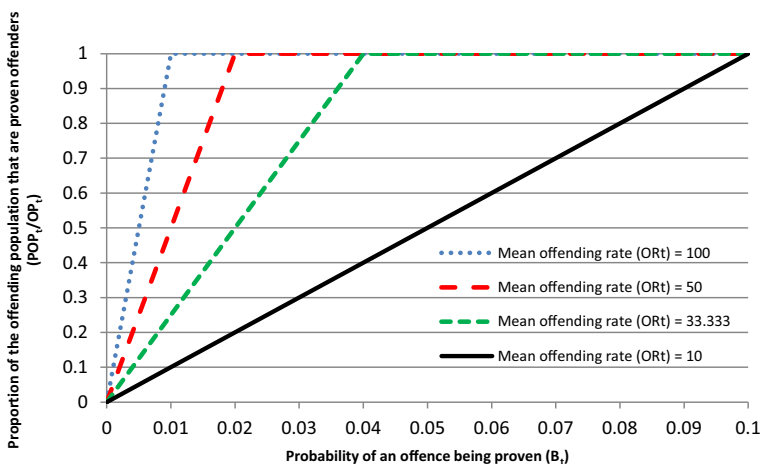
### Separation of adult (18+ years) and youth (10 to 17 years) populations

Published data on the criminal justice system in England and Wales provides information on both the youth and adult populations (MOJ, 2013; see Table 2). This allows the analysis to be applied separately to the different populations. In order to achieve this, it is assumed that  $B_t$  (the proportion of crimes proven) and  $j_t$  (mean number of proven crimes per index disposal/event) are the same for both adult and youth populations. Given this assumption the number of proven crimes committed by youths ( $PC_{t,j}$ ) can be estimated as follows:

$$m_{t,j} = POP_{t,j} * o_{t,j} * y_{t,j}$$

$$f_{t,j} = POP_{t,j} * j_t$$

$$PC_{t,j} = m_{t,j} + f_{t,j}$$



**Fig. 5** Effect of the mean offending rate of the offending population ( $OR_t$ ) on the relationship between the proportion of the offending population that are proven offenders ( $POP_t/OP_t$ ) and the probability of an offence being proven ( $B_t$ )

And the total number of crimes committed during a given interval  $t$  by youths ( $C_{t,j}$ ) are given by:

$$C_{t,j} = \left( \frac{PC_{t,j}}{PC_{t,j} + PC_{t,a}} \right) * C_t$$

Similarly for the adult population:

$$m_{t,a} = POP_{t,a} * o_{t,a} * y_{t,a}$$

$$f_{t,a} = POP_{t,a} * j_t$$

$$PC_{t,a} = m_{t,a} + f_{t,a}$$

And the total number of crimes committed during a given interval  $t$  by adults ( $C_{t,a}$ )<sup>5</sup> are given by:

$$C_{t,a} = \left( \frac{PC_{t,a}}{PC_{t,j} + PC_{t,a}} \right) * C_t$$

Individual analysis of the youth and adult population will only been carried out for the 2000 to 2013 period as relevant data is not available prior to this period.

### Sensitivity analysis

Whilst the actual values of  $C_t$  have been estimated from crime survey and police recorded crime data, any ambiguity has a number of elements, including possible errors in the estimate of  $j_t$  which has also been estimated from published data for the 2009 to 2013 period (Table 2).<sup>6</sup> Errors in the estimate of  $C_t$  values will affect estimated values of other variables derived from  $C_t$  (including  $B_t$ ,  $OR_t$ , and  $OP_t$ ). There is also some uncertainty around the estimated values of  $PC_t$ . Variations in the estimate of this variable will affect estimated values of variables derived from  $PC_t$  (including  $B_t$  and  $POR_t$ ). Finally there is some doubt about the values of  $POP_t$  – particularly for the period 1995–99 – which has been estimated from available data on the number of individuals supervised by probation and prison services over the period ( $s_t$ ). Variations in the estimate of this variable will affect estimated values of variables derived from  $POP_t$  (including  $OR_t$ ,  $N_t$ , and  $POR_t$ ). In order to determine how sensitive the analysis is to errors in estimated values of  $C_t$ ,  $PC_t$  and  $POP_t$  the analysis was repeated with values for

<sup>5</sup> Note that where variables apply specifically to adult or youth populations this is indicated by the  $j$  and  $a$  subscripts.

<sup>6</sup> Unpublished data for the youth population in the Ceredigion local authority area for the period 2009 to 2012 suggests  $j_t$  may be higher than the estimated value (1.28 as compared to 1.06; CYJS, unpublished).

these variables over the whole 1995 to 2012 period modified  $\pm 10\%$  in order to determine maximum and minimum values of other derived variables.

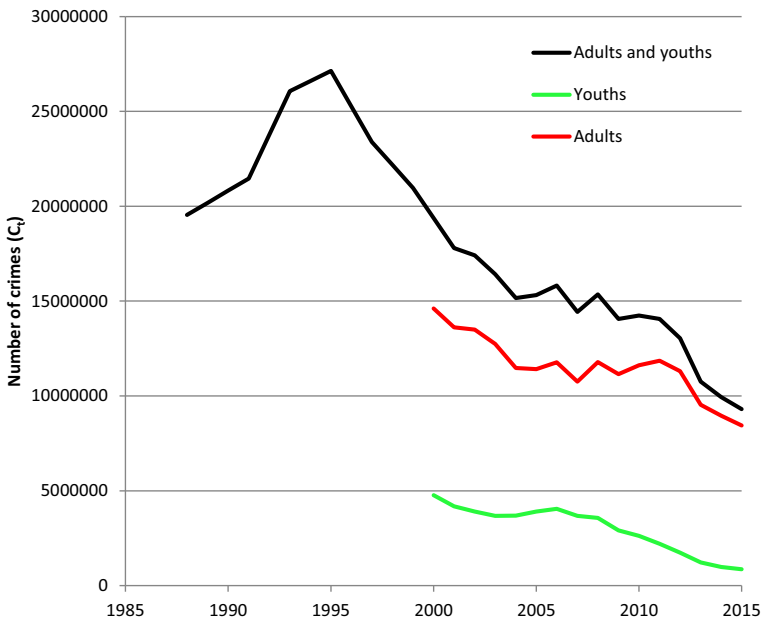
## Results

Between 1988 and 1995 the estimated actual number of crimes committed annually in England and Wales ( $C_t$ ) increased steadily. The crime level peaked in 1995 at around 27.5 million crimes annually (Fig. 6). Between 1995 and 2015, the number of crimes committed annually fell to around 9.3 million (equivalent to 18.2 million less crimes each year).

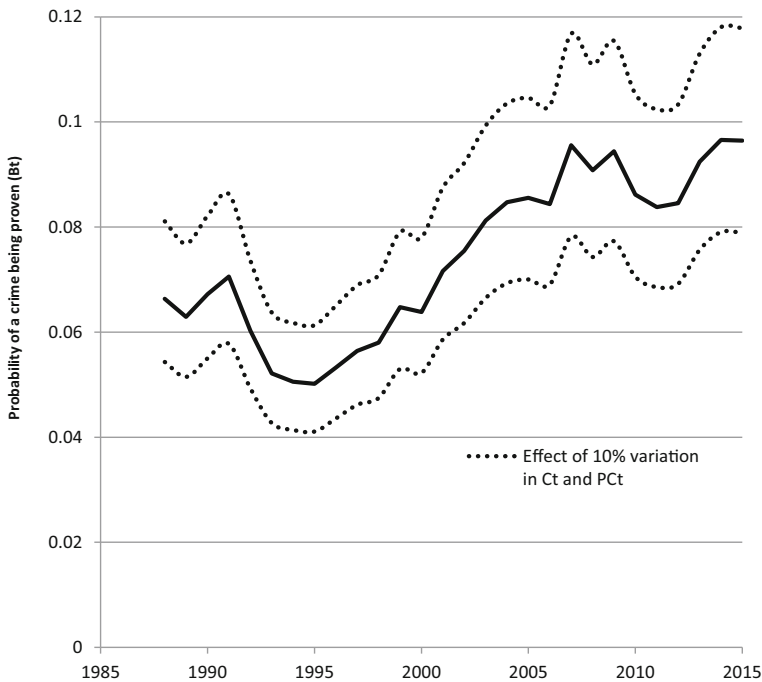
Over the 1995 to 2005 period the estimated probability of a crime being ‘proven’ in England and Wales ( $B_t$ ) almost doubled, increasing from 0.05 to 0.09 (Fig. 7). After 2008 the probability of a crime being proven remained more or less constant at around 0.09. Note that variations in the estimated values of  $C_t$  and  $PC_t$  had no effect on these trends.

Over the 1995 to 2008 period the estimated mean offending frequency of the offending population in England and Wales ( $OR_t$ ) decreased from around 40 to 20 crimes per offender per year (Fig. 8). Between 2008 and 2015 the mean offending frequency remained more or less constant at around 20 offences per offender per year. These trends in  $OR_t$  were very similar for both adult and youth offending populations and were unaffected by variations in  $C_t$  and  $POP_t$ .

Over the 1995 to 2008 period the estimated proportion of the population of England and Wales that were offenders ( $BOR_t$ ) increased slightly from 0.012 to 0.015 (Fig. 9).



**Fig. 6** Variation in the number of crimes committed in England and Wales over the 1988 to 2015 period. Data is plotted for crimes committed by youths ( $C_{j,t}$ ), adults ( $C_{a,t}$ ) and youths and adults combined ( $C_t$ )

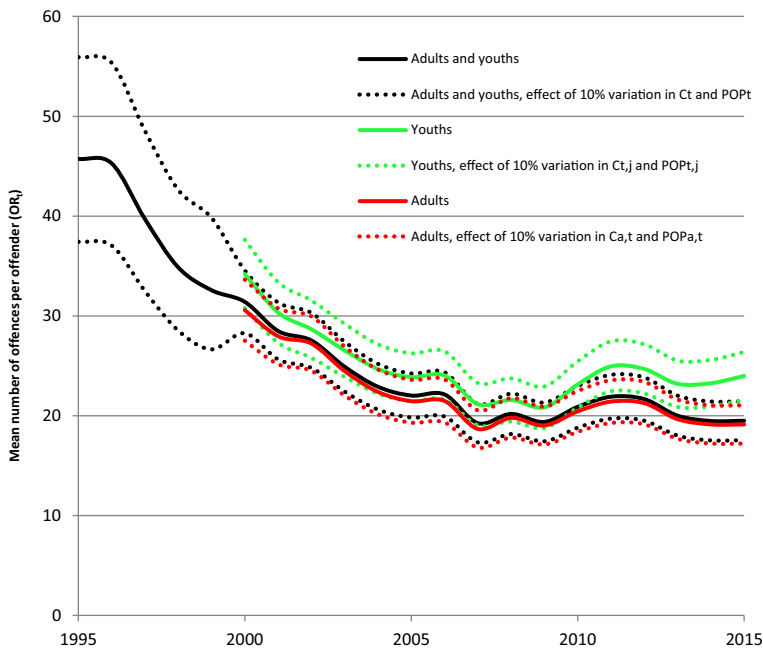


**Fig. 7** Variation in the probability of a crime being proven ( $B_t$ ) in England and Wales over the 1988 to 2015 period

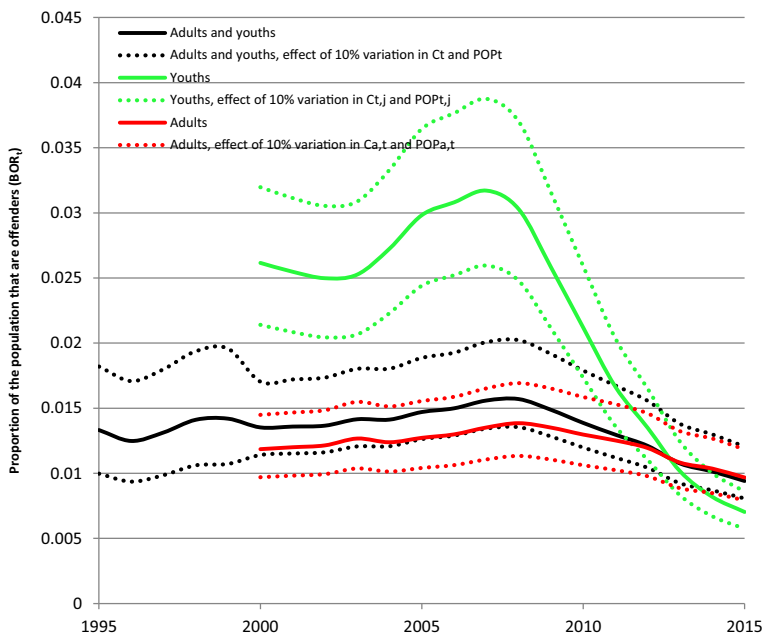
However, the proportion of the youth population that were offenders declined markedly between 2007 and 2015, from 0.038 to 0.007. A similar but less pronounced decline was observed for the adult population post 2008. Note that these trends were unaffected by variations in  $C_t$  and  $POP_t$  estimates nor was there a discernible relationship between the probability of a crime being proven and the proportion of the population (adult or youth) that were offenders.

The estimated size of the total offending population ( $OP_t$ ) increased steadily over the 1995 to 2008 period, increasing from 500,000 to 600,000 (Fig. 9), which can largely be explained by the increase in the size of the general population over this period (see Table 2). The rise was more marked for adults and most of the growth in general population size over this period was due to an increase in the adult population; the youth population size remained more static (see Table 2). Since 2008, the number of offenders has started to decrease, with this effect most evident for the youth population. It is important to note that the identified trends were unaffected by variations in the estimated values of  $C_t$  and  $POP_t$ .

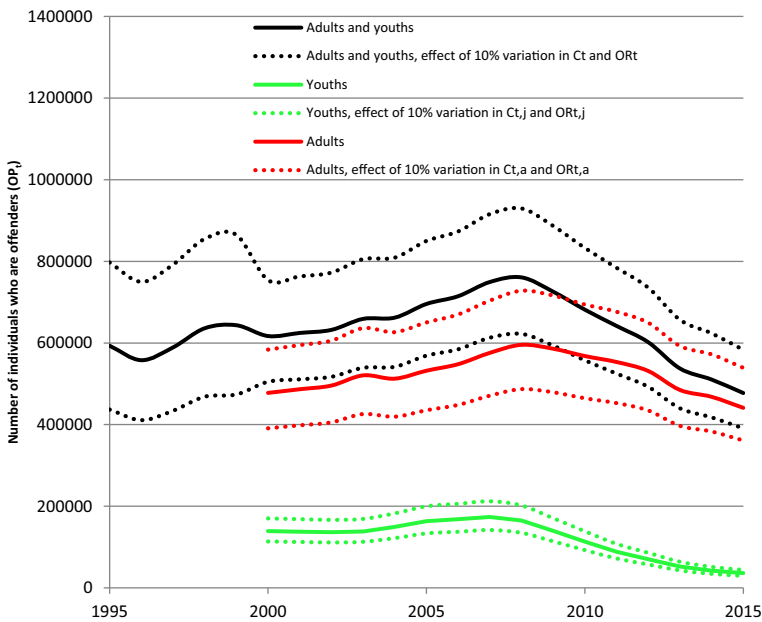
The proven offending frequency of proven offenders ( $POR_t$ ) decreased slightly over the 1995 to 2008 period, from around 2.4 to 1.8 proven crimes per proven offender per year (Figs. 10, 11). Subsequently  $POR_t$  has remained more or less constant. These trends mirror changes in the estimated offending frequency of offenders ( $OR_t$ ) over the same period (Fig. 8), but changes in the absolute value of  $POR_t$  are an order of magnitude less than changes in  $OR_t$ . These trends in  $POR_t$  are unaffected by variations in the estimated values of  $C_t$  and  $OR_t$ .



**Fig. 8** Variations in the offending rate ( $OR_t$ ) of the offending population in England and Wales over 1995 to 2015 period



**Fig. 9** Variation in the proportion of the youth, adult or youth and adult populations that were offenders ( $BOR_t$ ) over the 1988 to 2015 period



**Fig. 10** Variation in the offending population in England and Wales for the period 1995 to 2015. Data is plotted for youths ( $OP_{j,t}$ ), adults ( $OP_{a,t}$ ) and youths and adults combined ( $OP_t$ )

The increases in the annual number of offences between 1988 and 1995 (from 19,542,750 to 27,134,780 offences annually) and the reduction in annual number of offences between 1995 and 2008 (from 27,134,780 to 15,355,620 offences annually) can be attributed mainly to variations in the offending rate. Specifically, over the 1995 to 2008 period, the offending rate decreased from 45.74 to 20.19, which accounts for a total of over 15 million less offences or a 129% decrease in offences over this period. However, the number of offences did not decrease by the same proportion due to the number of offenders actually increasing over the period and thereby offsetting any potential reduction. There is a close inverse relationship between the offending rate of offenders (offences per offender per year -  $OR_t$ ) and the probability of an offence being proven (Fig. 12). The increase in the offending rate over the 1988 to 1995 period is closely linked to the decrease in the probability of an offence being proven over this period (Fig. 8). Likewise the reduction in the offending rate over the 1995 to 2008 period is closely linked an increase in the probability of an offence being proven over this period. Thus, most of the variation in the annual number of offences over the 1988 to 2008 period can be accounted for by variations in the probability of offences being proven.

The above does not, however, apply over the 2008 to 2015 period, as the offending rate varied little from year to year (20.19 in 2008 and 19.5 in 2015; see Fig. 8). The reduction in the offending rate over this period can only account for 522,438 less offences (9% of the actual reduction). Over the 2008 to 2015 period, most of the reduction in the annual number of offences is due to a decrease in the number of offenders ( $OP_t$ ) which decreased from 760,676 to 477,393.

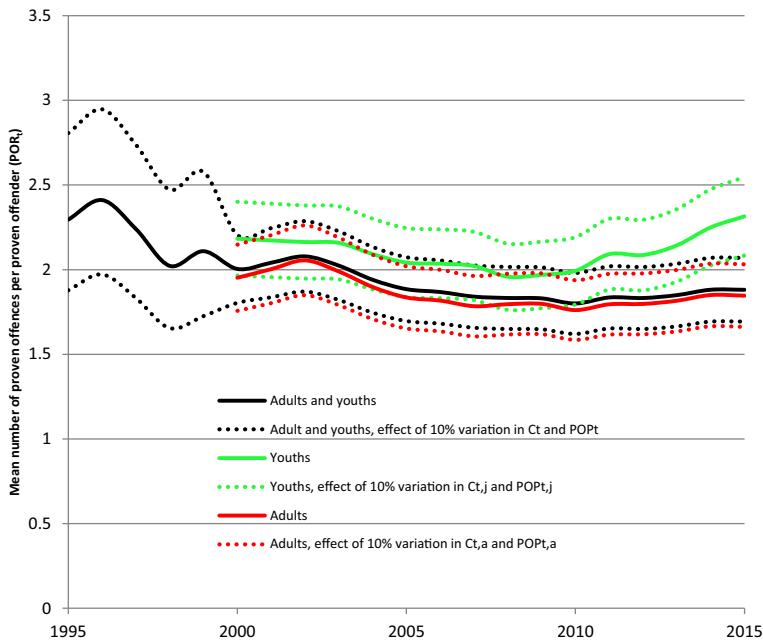


Fig. 11 Variation in the number of proven offences per proven offender ( $POR_t$ ) over the 1995 to 2015 period

## General discussion

Reductions in recorded crime in England and Wales since the mid-90s have previously been reviewed in the literature, including innovative policing, economic prosperity and

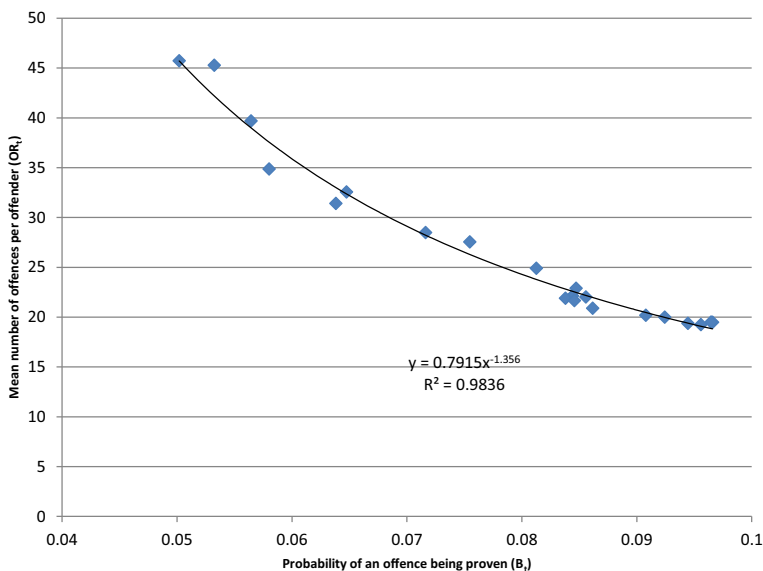
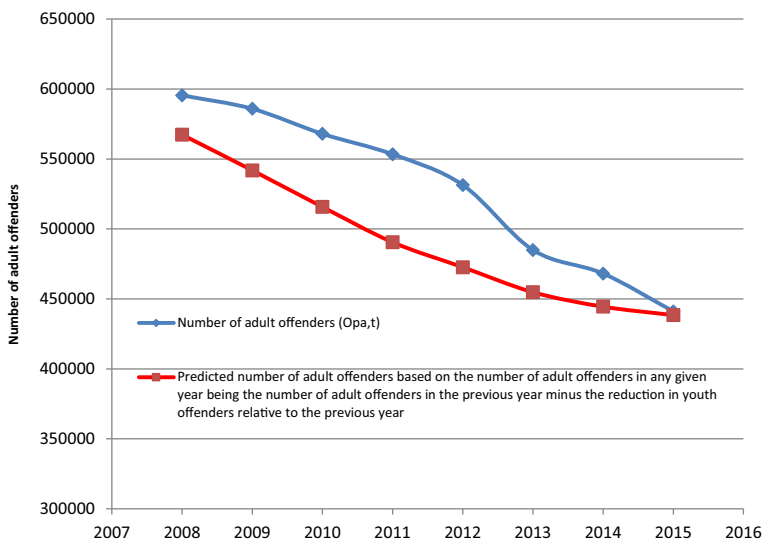


Fig. 12 Inverse relationship between the probability of an offence being proven ( $B_t$ ) and the offending rate of offenders ( $OR_t$ )

changes in reporting practices [55]. However, the rate of decline has slowed considerably and indeed the most recent figures for 2015 suggest a slight increase in overall recorded crime for the first time in nearly two decades (MOJ, 2017). The analysis presented here for England and Wales demonstrates that, since 2005, the reductions have in fact been largely accounted for by a reduction in the youth offending population (see Fig. 1; [56]). By comparison, the adult offending population has remained more or less static for the last decade. The results have important implications for understanding, not only the way in which crime/offending rates are recorded, but also the impact of crime reduction initiatives. The overall reduction in the number of offenders over the 2005 to 2015 period is closely linked to a significant reduction in the proportion of the youth population that offends in any given year (see Fig. 9). In total, 45% of the reduction in offences over the 2005 to 2015 period was predominantly attributable to a reduction in offending by young people [56]. In addition, the number of youth offenders appears to have contributed to a ‘knock on’ effect on the number of adults offending in subsequent years: the overall reduction in adult offenders over the period can be predicted by reducing year on year the number of adult offenders by the decline in the number of youth offenders relative to the previous year (see Figs. 1 and 13; [57, 58]). In essence, this is the outcome of young people not offending [when young] and then subsequently did not go on to offend as adults [59]. The empirical support for this proposition (see Fig. 1) is the proportion of the youth population offending starting to contract in 2005.

One key opinion supported by this analysis, is the suggestion that the *binary proven reoffending rate* tells us very little about the actual dynamics of the criminal justice system in England and Wales. Binary reoffending rates are largely insensitive and independent to major trends being observed in published data (see Fig. 2; [8]). Therefore, there is a case to be made for not relying upon the binary offending rate



**Fig. 13** Actual reduction in the number of adult offenders between 2008 and 2015 compared with predicted cumulative reduction based on year on year reductions in the number of youth offenders (assuming that youths who do not offend when they are young)



in order to assess the performance of the criminal justice system and its individual agencies [60]. For example, the mean offending frequency of an offending population and the actual number of crimes committed by that population could reduce by 90%, but so long as each offender in the population continues to offend at a frequency high enough to ensure that at least one of their crimes will be proven, the binary offending rate will remain static [61]. The binary reoffending rate also fails to register changes in the actual *proportion* of the population committing crime as well as being sensitive to changes in the probability of crimes being proven. Subsequently, any increase in the probability of offences being proven could easily lead directly to an *apparent* increase in the binary reoffending rate. Recent data from the MOJ (2017) indicates a 1.9% increase in the binary reoffending rate for juveniles in the past 12 months and 3.8% increase since 2003. The corresponding figures for the adult population are small increase of 0.2% and a fall of 1.7% in the longer term. Hence, we can see that although the binary reoffending rate for the youth population has increased, the size of the cohort has decreased by over 60% since 2005 (see Fig. 1).

### Limitations and implications

The main limitation inherent to all analyses of the type undertaken here are that the use of official statistics is marred by underreporting and various counting anomalies [11, 48]; this is particularly so for youth crime and youth victimisation [62]. Broad trends in the data are always of interest to policy makers and practitioners as evidence of effective interventions. However, large data sets are unable to identify causality and it is always possible that an extraneous variable(s) could account for the observed trends [60]. Similarly, analysis of aggregated data can lead to different outcomes when compared with other sources [63], and mask varying geographical variations [64]. Given the large variability in youth justice practice in the UK in recent years, these localised disparities may require further analysis to ascertain the full picture of the youth offending population [65]. We clearly only know about the crime committed by young people when they have been caught; we simply don't know what proportion of unsolved crime is committed by young people [16]. Other crime types, such as cyber-bullying, are likely to be experienced more by young people, but vastly underreported. Many crimes committed by young people towards other young people, including assault and theft, are much more likely to be dealt with by parents, teachers etc., if reported at all [66].

The second limitation is being able to link the proposed changes in policy to actual observed reductions in crime. To be able to map policy changes to macro outcomes without controlling for the many extraneous variables is an ambitious undertaking. Indeed, several previous analyses have provided plausible – even competing – accounts of the crime drop that began back in the mid-90s. For example, it has been suggested that the extensive worldwide dissemination of smartphones and online games since 2006/07 has led to children and young people spending a lot of their free time ‘looking at screens’; the subsequent visibility of young people ‘on the streets’ could therefore explain the youth crime drop seen in many countries since 2007 [67]. However, such a finding does not explain the observed pre-2007 reductions in youth crime. Similar explanations such as the ‘abortion-crime’ link (see [68]) or the decline of the crack epidemic [69], have also failed to account for longer-term trends or be applicable to

different countries that experienced similar phenomenon [55, 70]. It can be argued that the application of diversionary practices that seek to minimise the contact of young people with the potentially criminalising effects of the youth criminal justice system can result in reduced youth crime [30, 71].

## Conclusion

Discussions in both policy and academic literature have attempted to explore several avenues in providing a convincing account for the relatively large and persistent falls in recorded crime in England and Wales [61, 72]. The analysis conducted here suggests that the major driver behind these figures – from around 1995 and the subsequent decade – were largely attributed to the probability of a crime being proven. The introduction of the Criminal Justice and Public Order Act 1994 and the Crime and Disorder Act 1998 would appear to be critical policy shifts that correlate with these observed reductions. From 2005, there was a general stability in the adult offending population/offending frequency, but the crime rate continued to fall. Our analysis suggests that this is directly linked to a decrease in the youth offending population following various policy initiatives designed to address youth crime and anti-social behaviour, such as the National Strategy for the Policing of Children and Young People [73] and a move towards welfare-based approaches for lower level youth offending [17, 34]. In addition, the Criminal Justice Act 2003 and MAPPA are key drivers of change in the way offending behaviour is managed and recorded. Investment in youth justice welfare and diversion initiatives has the potential to not only reduce youth offending in the short to medium term, but also moderate the number of young people that later go onto become adult offenders [74]. The importance of these reductions demands the continued and targeted funding of appropriate services [65], despite the current climate of austerity and recent calls to shift away from the causes of offending, vulnerability and diversion.

## Appendix

**Table 4** Variables and parameters used in the analysis

Main variables used in the analysis/model	
t	Year
P	Population
PC	Proven Crimes
C	Total Crimes
OP	Offending Population – total number of offenders
POP	Proven Offending Population – total number of proven offenders
<i>maxPOP</i>	Maximum possible number of proven offenders
<i>minPOP</i>	Minimum possible number of proven offenders
OR	Offending Rate – mean number of offences per offender

**Table 4** (continued)

POR	Proven Offending Rate – mean number of proven offences per proven offender
B	Probability of an offence being proven
BOR	Proportion of Population that are offenders
N	Proportion of Offending Population that are proven offenders
Com	Total number of possible combinations
Pr <sub>w</sub>	Probability of a sample containing w proven crimes linked to same offender
Published variables used to estimate values of main variables	
v	Crime survey estimate of the number of crimes
r	Police recorded crimes
e	Number of police recorded crimes that are crimes that are not reported in the crime survey
g	Proportion of police recorded crimes that are crimes that are not reported in the crime survey
m	Proven reoffences
o	Proportion of proven offenders that reoffend
y	Proven reoffending rate (mean number of proven reoffences per proven offender)
s	Number of individuals under supervision
j	Mean number of proven crimes per index disposal/event
f	Number of proven crimes linked to index disposals/events
x	Numeric label of a particular offending frequency class
n	Number of offending frequency classes
w	Number of distinct elements in a collection.
d	Proportion of police recorded crimes that are cleared up.

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